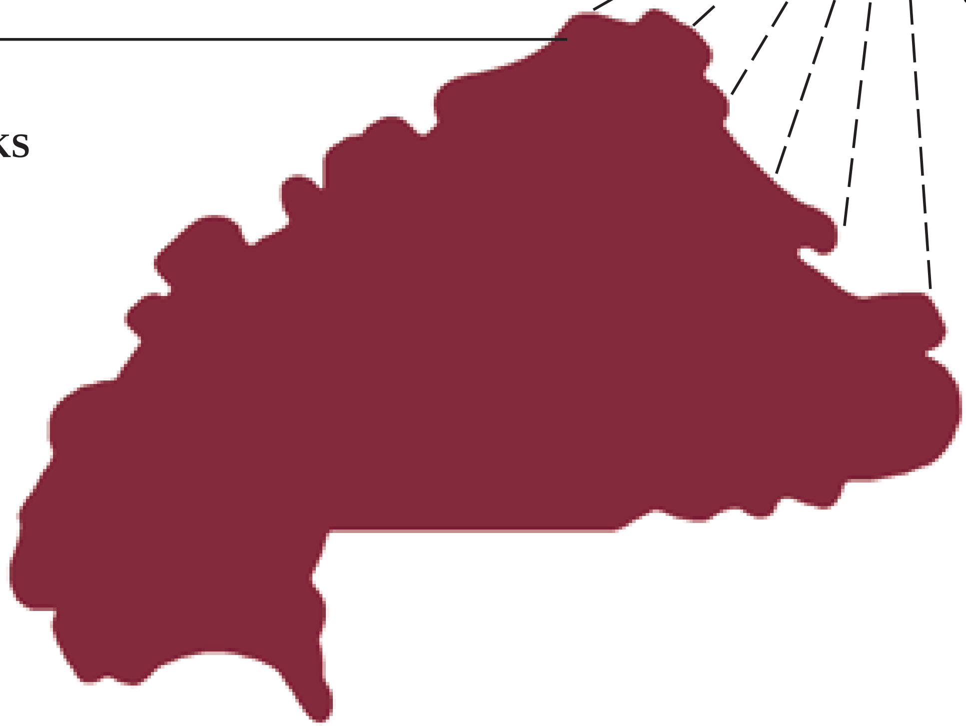
Nutrition of Young Children and Mothers in Burkina Faso, 1998-99





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NUTRITION OF YOUNG CHILDREN AND MOTHERS IN BURKINA FASO

Findings from the 1998-99 Burkina Faso DHS Survey

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Introduction

Malnutrition[1] is one of the most important health and welfare problems among infants and young children in Burkina Faso. It is a result of both inadequate food intake and illness. Inadequate food intake is a consequence of insufficient food available at the household level and/or improper feeding practices. Improper feeding practices include both the quality and quantity of foods offered to young children as well as the timing of their introduction. Poor sanitation puts young children at increased risk of illness, which adversely affects their nutritional status. Both inadequate food intake and poor environmental sanitation reflect underlying social and economic conditions.

Malnutrition has significant health and economic consequences, the most serious of which is an increased risk of death. Other outcomes include an increased risk of illness and a lower level of cognitive development, which results in lower educational attainment. In adulthood, the accumulated effect of long-term malnutrition can be a reduction in worker productivity and increased absenteeism in the workplace; these may reduce a person's lifetime earning potential and ability to contribute to the national economy. Furthermore, malnutrition can result in adverse pregnancy outcomes.

The Burkina Faso data presented here are from the 1998-99 Burkina Faso Demographic and Health Survey (BFDHS), a nationally representative survey of 4,871 households implemented by the Institut National de la Statistique et de la Démographie. The study was undertaken with funding from the U.S. Agency for International Development (USAID). Logistical assistance was provided by the United Nations Population Fund (UNFPA) and the National AIDS Control Program (NASCOP). Technical assistance was provided by Macro International Inc.

The 1998-99 Burkina Faso DHS survey would not have been possible without the help of the following organizations in Burkina Faso: the Direction de la Santé Familiale (DSF), the Comité National de Lutte contre le Sida (CNLS), the Comité National de Lutte contre la Pratique de l'Excision (CNLPE), the Centre National de Nutrition (CNN) and the Institut National d'Alphabétisation (INA).

Fieldwork was conducted from September 1998 to March 1999. Of the 6,218 living children age 0-59 months that were part of the study, 3,792 are included in these analyses. Data collected on these children include height, weight, age, breastfeeding history, feeding patterns, and selected health information. The BFDHS also collected data on relevant sociodemographic characteristics of both the child and the mother. For comparison purposes, DHS surveys conducted in other sub-Saharan countries are also presented.

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[1] The technical method of determining a *malnourished* population, as defined by the National Center for Health Statistics (NCHS), the Centers for Disease Control (CDC), and the World Health Organization (WHO), is presented in Appendix 2.

Figure 1: Malnutrition among Children under 5 Years, Burkina Faso

In Burkina Faso:

- **Thirty-seven percent of children aged 0 to 59 months are chronically malnourished**. In other words, they are too short for their age or ***stunted***.[1] The proportion of children in Burkina Faso who are stunted is more than 18 times the level expected in a healthy, well-nourished population.

- **Thirteen percent of children under 5 years are wasted.**[2] Acute malnutrition, manifested by wasting, results in a child being too thin for his or her height. The level of wasting in Burkina Faso is more than six times the level expected in a well-nourished population.

- **Thirty-four percent of children under 5 years are *underweight***[3] for their age. This is 12 times the level expected in a healthy, well-nourished population.

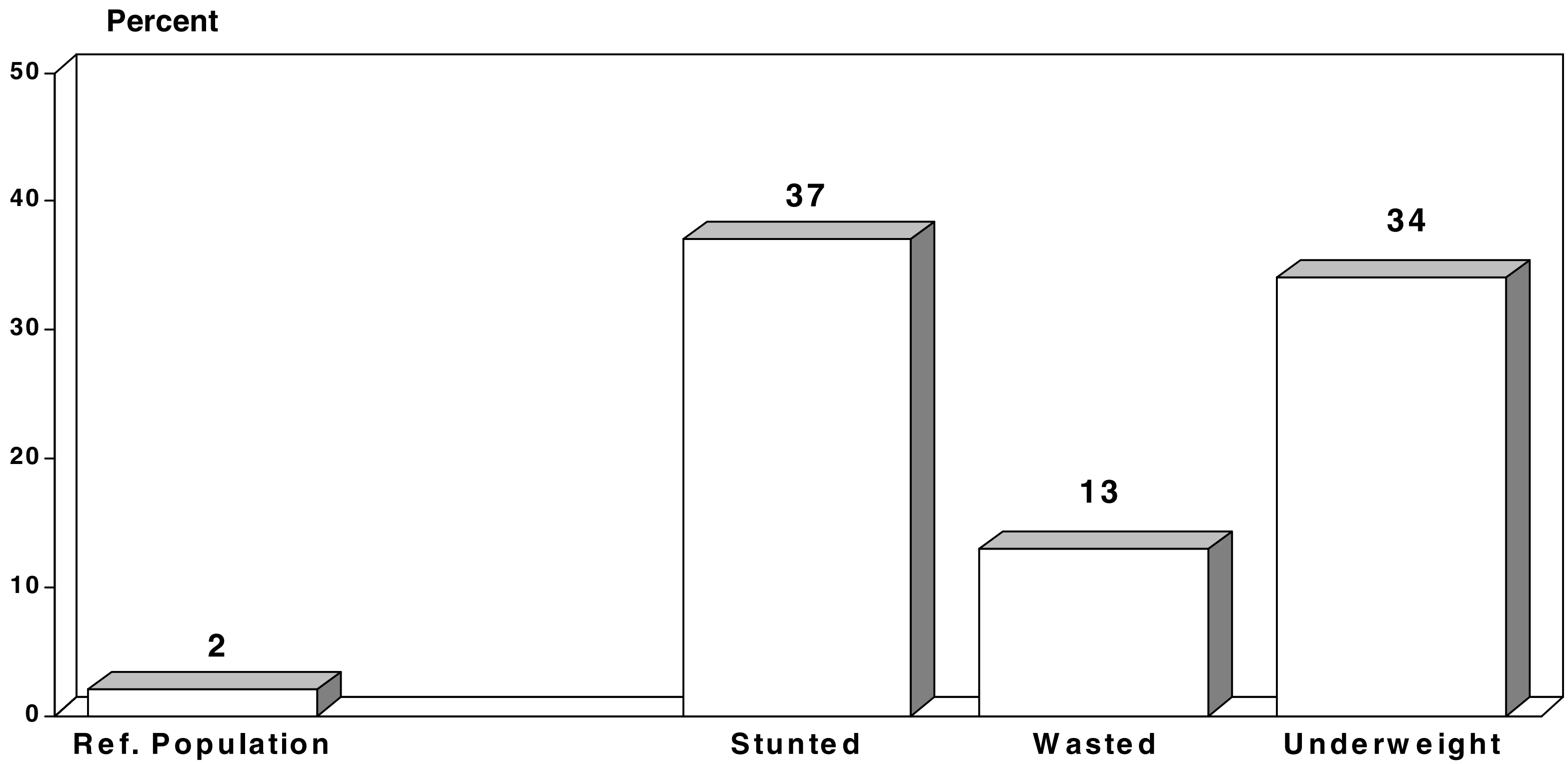
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[1] A *stunted* child has a height-for-age Z-score that is below -2 standard deviations (SD) based on the NCHS/CDC/WHO reference population. Chronic malnutrition is the result of an inadequate intake of food over a long period of time and may be exacerbated by chronic illness.

[2] A *wasted* child has a weight-for-height Z-score that is below -2 SD based on the NCHS/CDC/WHO reference population. Acute malnutrition is the result of a recent failure to receive adequate nutrition and may be affected by acute illness, especially diarrhea.

[3] An *underweight* child has a weight-for-age Z-score that is below -2 SD based on the NCHS/CDC/WHO reference population. This condition can result from either chronic or acute malnutrition, or a combination of both.

Figure 1
Malnutrition among Children under 5 Years, Burkina Faso



Note: ***Stunted*** **reflects chronic malnutrition;** ***wasted*** **reflects acute malnutrition;** ***underweight*** **reflects chronic or acute malnutrition, or a combination of both.**

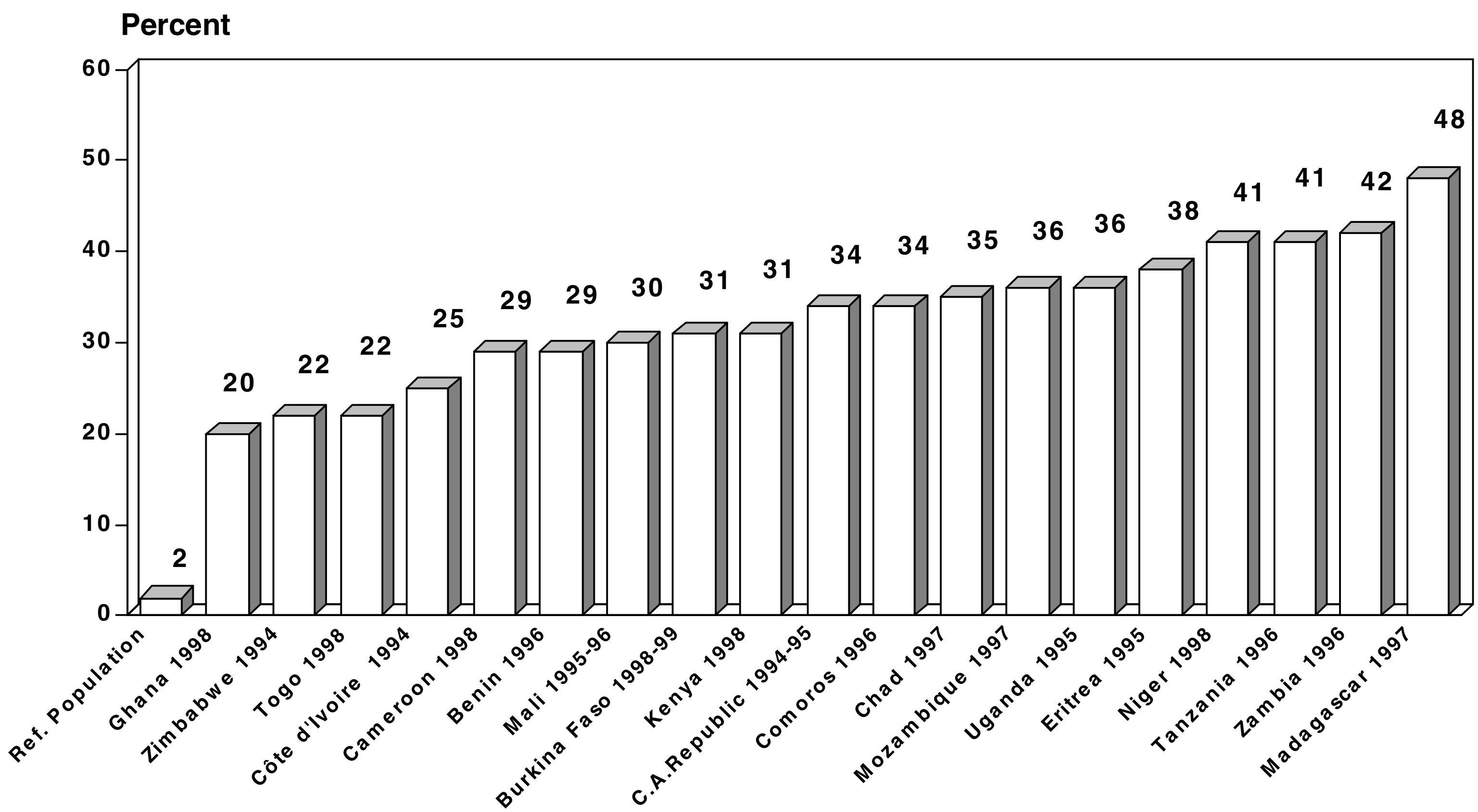
Source: BFDHS 1998-99

Figure 2: Stunting Among Children under 3 Years in Sub-Saharan Countries, DHS Surveys 1994-1999

Among the sub-Saharan countries surveyed:

- The percentage of children less than 3 years who are *stunted* ranges from 20 to 48 percent. **At 31 percent, the proportion of children stunted in Burkina Faso is in the middle range of countries measured.** Stunting is a good long-term indicator of the nutritional status of a population because it is not markedly affected by short-term factors such as season of data collection, epidemics, or acute food shortages.

Figure 2
Stunting among Children under 3 Years in Sub-Saharan Countries, DHS Surveys 1994-1999



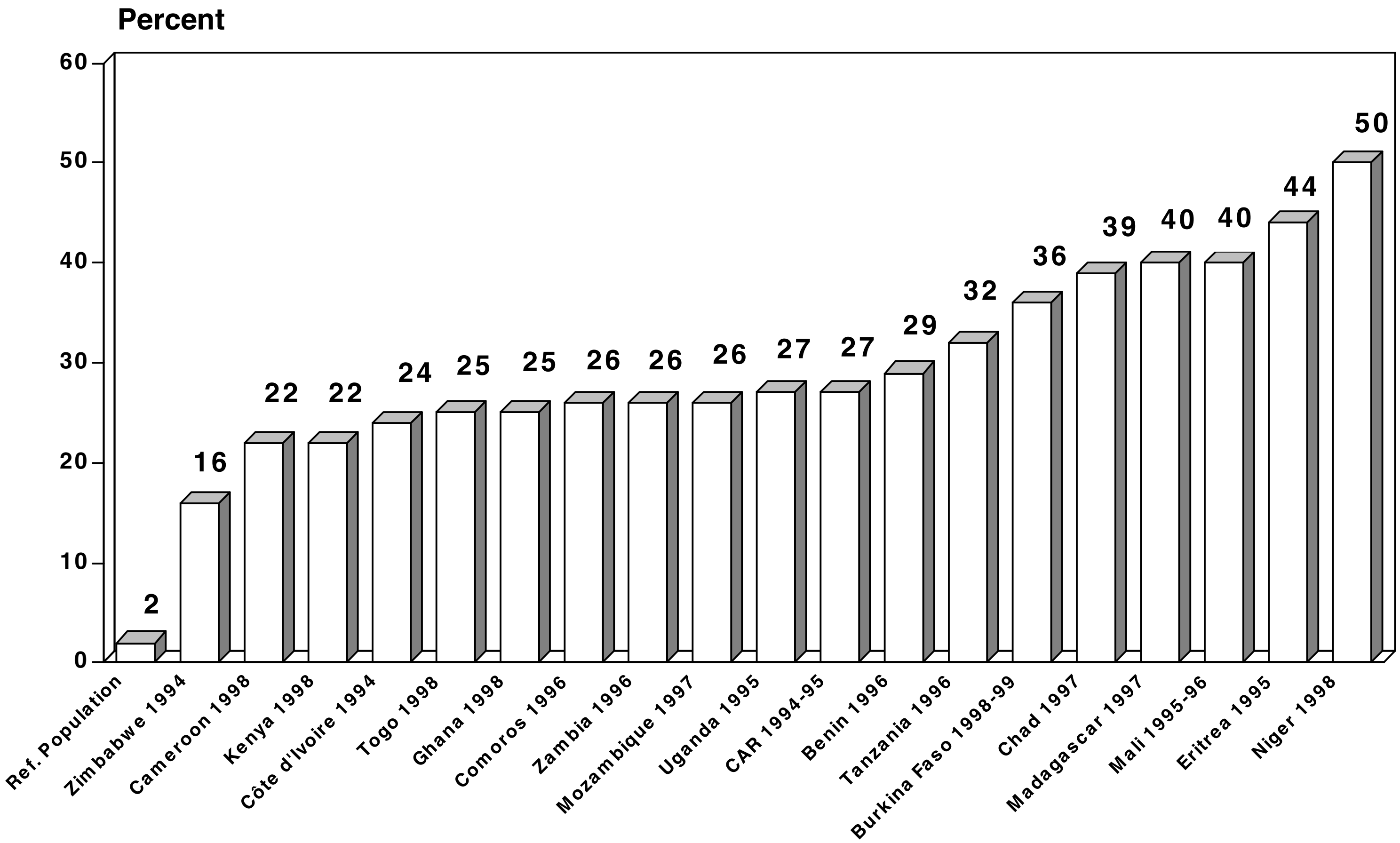
Note: *Stunting* **reflects chronic malnutrition** **Source: DHS Surveys 1994-1999**

Figure 3: Underweight among Children under 3 Years in Sub-Saharan Countries, DHS Surveys 1994-1999

Among the sub-Saharan countries surveyed:

- The percentage of children less than 3 years who are *underweight* can range from 16 to 50 percent. **Burkina Faso is in the upper half of the range with 36 percent of children underweight.** Underweight status is indicative of children who suffer from chronic malnutrition, acute malnutrition, or both. Underweight status may be influenced by both short- and long-term determinants of malnutrition, and is often used as a general indicator of a population's health status.

Figure 3
Underweight among Children under 3 Years in Sub-Saharan Countries, DHS Surveys 1994-1999



Note: ***Underweight*** **reflects chronic or acute malnutrition or a combination of both.**

Source: DHS Surveys 1994-1999

Figure 4: Stunting, Wasting and Underweight by Age, Burkina Faso

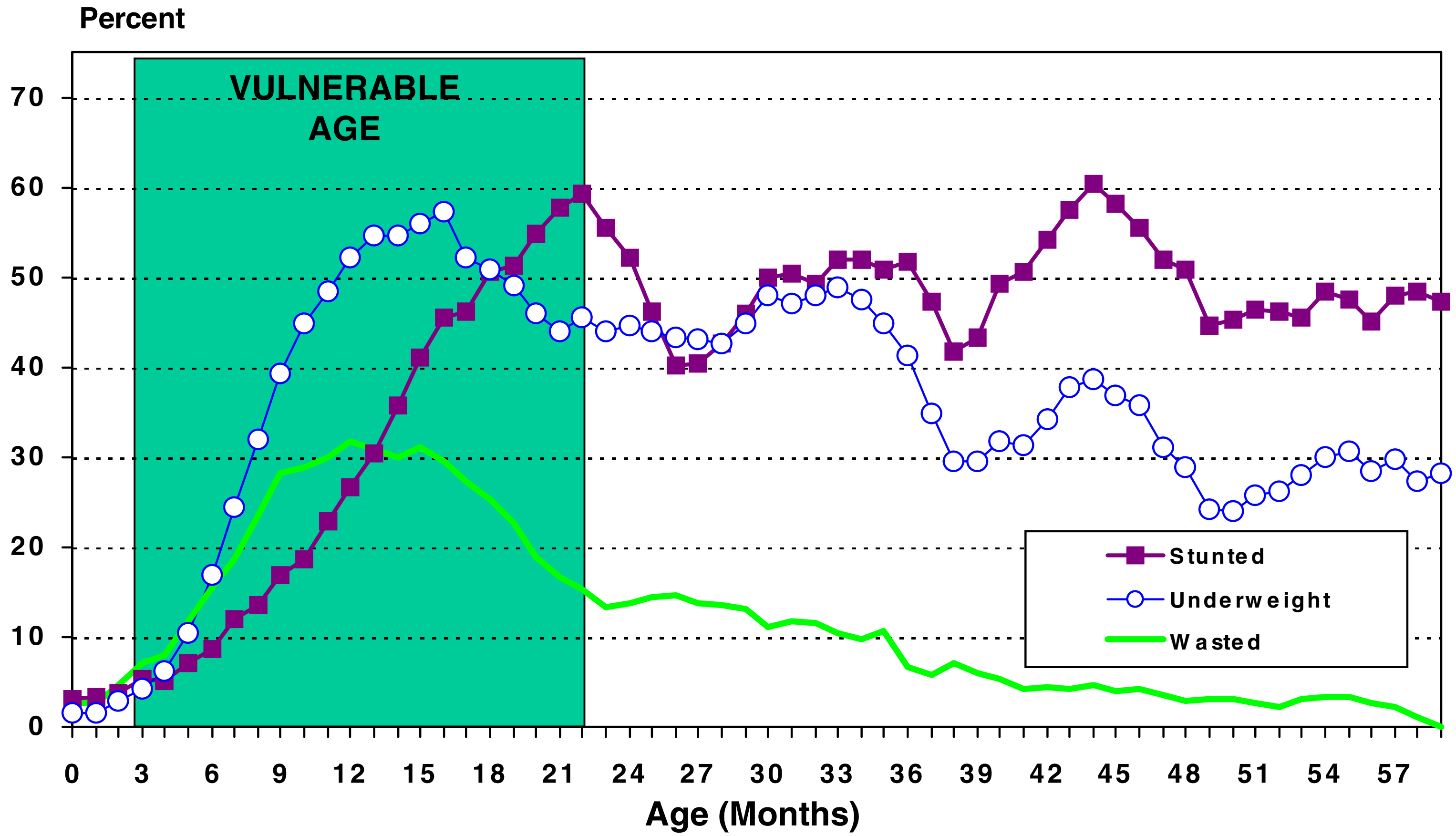
In Burkina Faso, the time between 3 months and 22 months of age is a vulnerable period:

- **The proportion of stunted children rises steadily between 3 and 22 months, peaking at 60 percent.** From 22 to 27 months, stunting declines to 40 percent. After this decline, stunting rates jump again to 60 percent at 44 months of age. This is followed by a swift decline to 45 percent around 49 months of age. From 49 months to five years of age stunting rates hover below 50 percent.

- **The proportion of wasted children increases to 32 percent by one year of age.** After declining to 16 percent at 21 months of age, the proportion of wasted children gradually decreases. By the fifth year of the life, only 1 percent of children are wasted.

- **The proportion of children underweight increases during the first few months of life, reaching a peak of 58 percent at 15 months.** From 15 to 33 months of age, this rate dips to 48 percent. Between 34 and 38 months of age, the proportion of underweight children drops to 30 percent. After this, the number of underweight children increases again, reaching 39 percent by 45 months. By the fifth year of life, the proportion of underweight children has declined to 29 percent.

Figure 4
Stunting, Wasting, and Underweight by Age, Burkina Faso



Note: ***Stunting*** **reflects chronic malnutrition;** ***wasting*** **reflects acute malnutrition;** ***underweight*** **reflects chronic or acute malnutrition, or a combination of both. Plotted values are smoothed using a five month moving average.**

Source: BFDHS 1998-99

Figure 5: Feeding Practices of Infants under 4 Months, Burkina Faso

Improper feeding practices, in addition to diarrheal disease, are important determinants of malnutrition. WHO recommends that *all infants be exclusively breastfed from birth to about 6 months of age.*[1] In other words, infants should be fed only breast milk during the first six months of their lives.

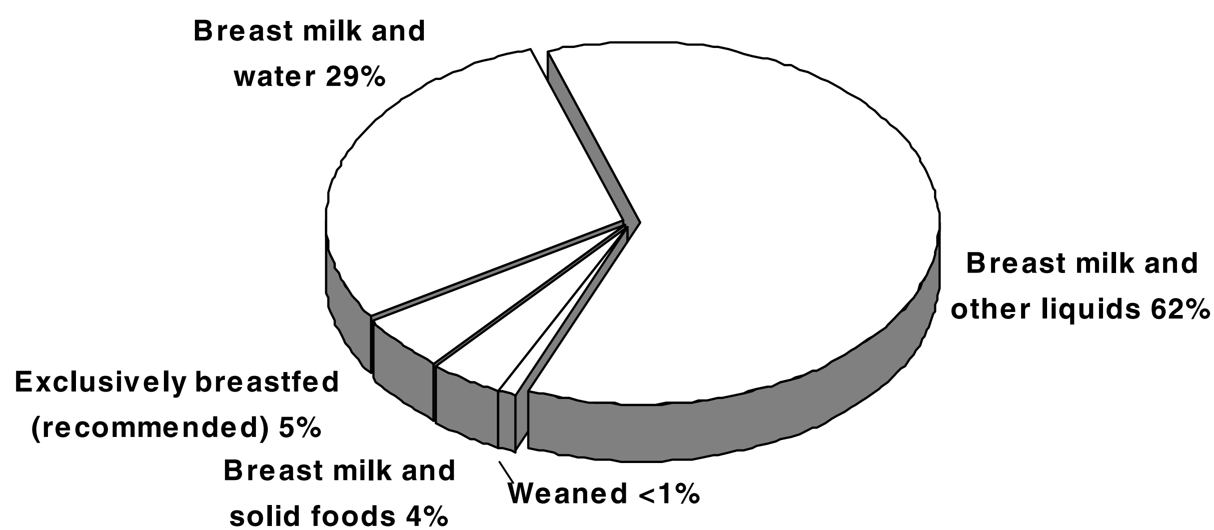
In Burkina Faso, the introduction of liquids (water, sugar water, juice, other milks, and formula) and solid foods takes place earlier than the recommended age of about 6 months. This practice has a deleterious effect on nutritional status for a number of reasons. First, the liquids and solid foods offered are nutritionally inferior to breast milk. Second, the consumption of liquids and solid foods decreases the infant's intake of breast milk, which in turn reduces the mother's supply of milk. (Breast milk production is determined, in part, by the frequency and intensity of suckling.) Third, feeding infants liquids and solid foods increases their exposure to pathogens and thus puts them at a greater risk of diarrheal disease.

- **In Burkina Faso, only 5 percent of infants under the age of 4 months are exclusively breastfed, as recommended by WHO.**

- **The majority of infants under 4 months of age are not fully breastfed.** This means that over 65 percent of infants are given other liquids and solid foods when their dietary needs would be better satisfied by breast milk only.

[1] World Health Organization, Forty-seventh World Health Assembly (WHA 47.5), May 9, 1994.

Figure 5
Feeding Practices of Infants under 4 Months, Burkina Faso



Note: WHO recommends that all infants be breastfed exclusively to about six months of age.

Source: BFDHS 1998-99

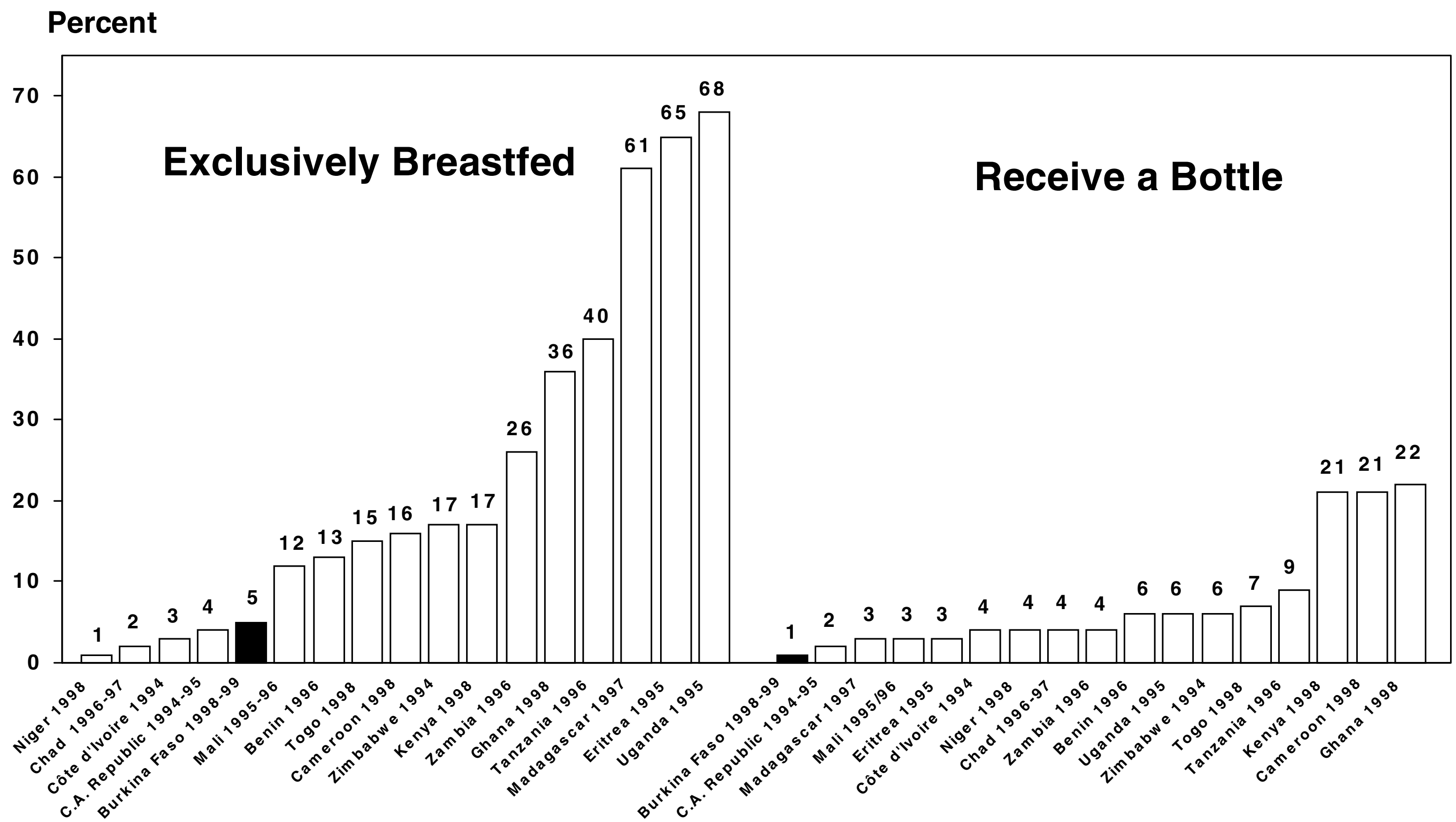
Figure 6: Infants under 4 Months Who are Exclusively Breastfed and Those Who Receive a Bottle in Burkina Faso Compared with Other Sub-Saharan Countries

The failure to exclusively breastfeed young infants and the introduction of liquids and solid foods at too early an age increases the risk of diarrheal disease, an important cause of morbidity and mortality in Africa.

- In most of the sub-Saharan countries surveyed, relatively few mothers of infants under 4 months follow the recommended practice of exclusive breastfeeding. Burkina Faso is no exception. **In Burkina Faso, only 5 percent of mothers breastfeed their infants exclusively**.

- **Bottle-feeding, which is not recommended by WHO, is practiced by only 1 percent of mothers in Burkina Faso.** Improper sanitation with bottle-feeding can introduce pathogens to the infant. Infant formulas (which are often watered down) and other types of milk do not provide comparable nutrition to breast milk for infants less than 6 months of age. For these reasons, bottle-feeding puts infants at a higher risk of illness and malnutrition.

Figure 6
Infants under 4 Months Who Are Exclusively Breastfed and Those Who Receive a Bottle in Burkina Faso Compared with Other Sub-Saharan Countries



Note: Information on feeding practices is based on the 24 hours preceding the survey. WHO recommends that all infants should receive nothing but breast milk up to 6 months of age.

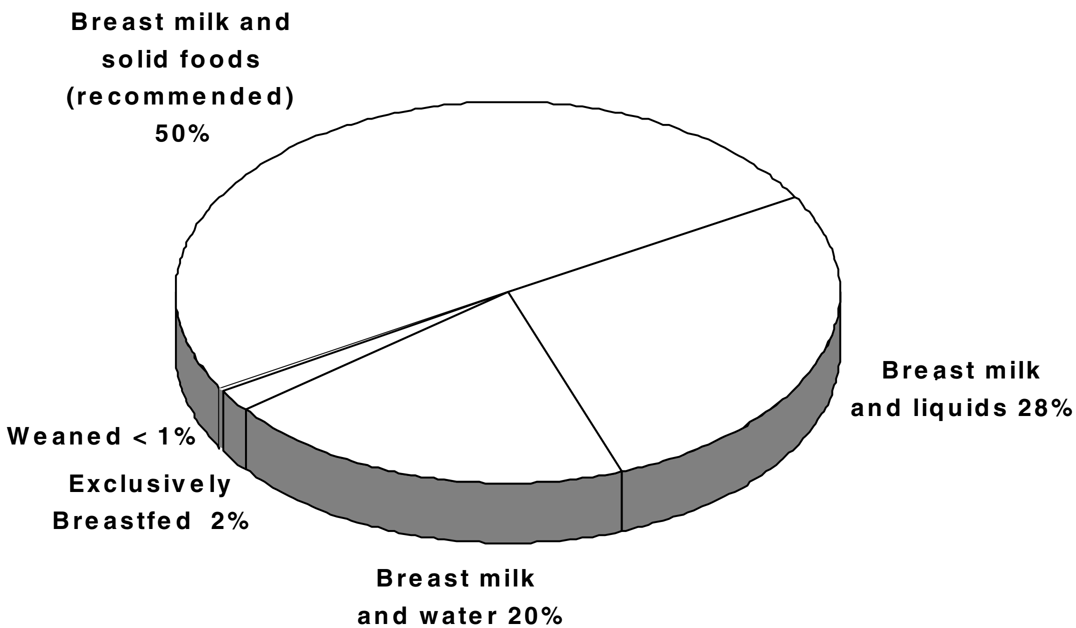
Source: DHS Surveys 1994-1999

Figure 7: Feeding Practices of Infants Age 6 to 9 Months, Burkina Faso

WHO recommends that solid foods be introduced to infants around the age of 6 months because breast milk alone is no longer sufficient to maintain a child's optimal growth. Thus, *all infants over 6 months of age should receive solid foods* along with breast milk.

- **Fifty percent of infants age 6 to 9 months receive solid food in addition to breast milk.** This means that less than half of infants age 6 to 9 months are fed according to the recommended practice. Less than 1 percent of children are weaned by this period, i.e., only a small minority of children do not receive the continued benefits of breast milk.

Figure 7
Feeding Practices of Infants Age 6 to 9 Months, Burkina Faso



Note: WHO recommends that by the age of 6 months all infants should receive solid foods and liquids in addition to breast milk.

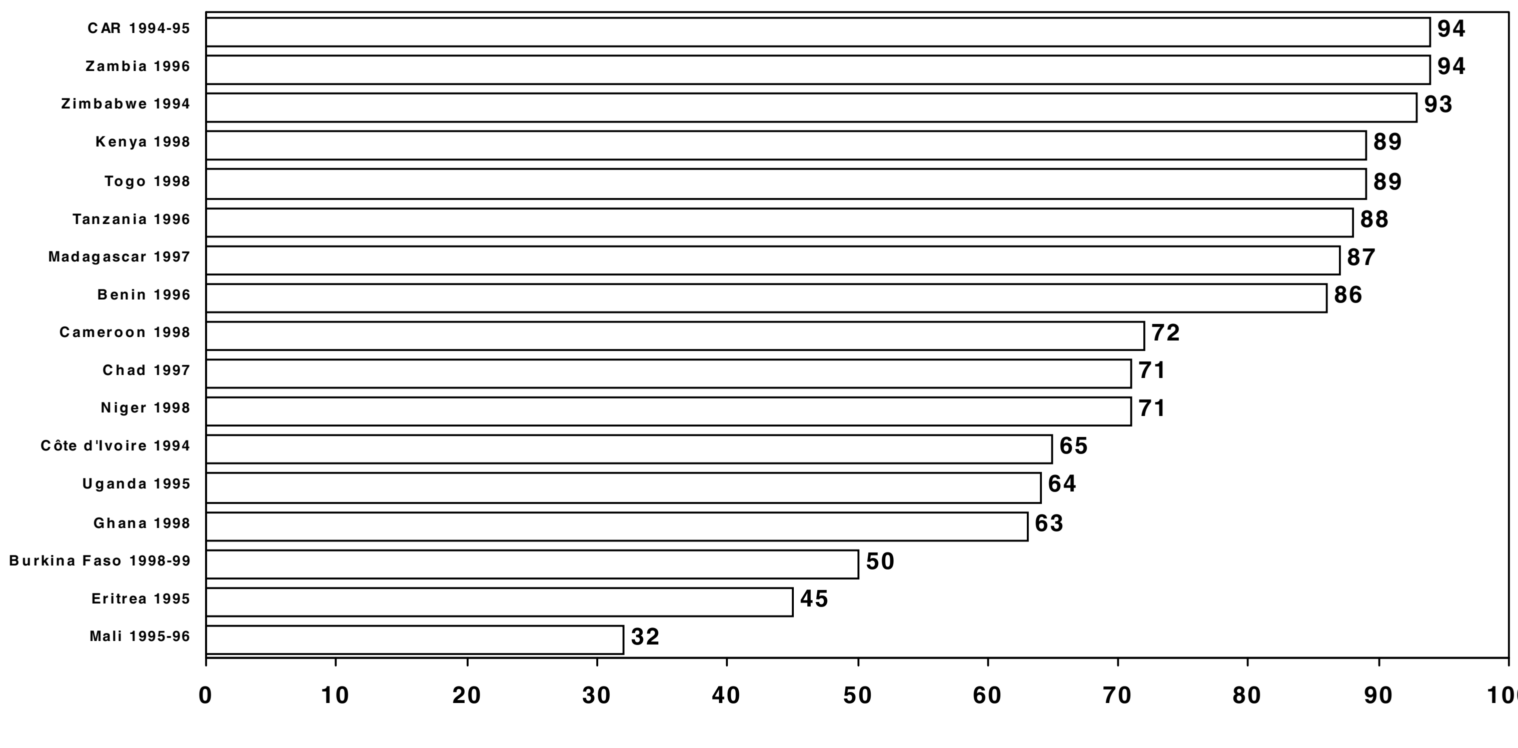
Source: BFDHS 1998-99

Figure 8: Infants Age 6 to 9 Months Receiving Solid Foods in Addition to Breast Milk in Burkina Faso Compared with Other Sub-Saharan Countries

Optimal infant feeding practices include the introduction of complementary foods around 6 months of age. The introduction of complementary feeding is necessary because breast milk is no longer sufficient to satisfy the developing infant's energy, protein, and micronutrient needs. All infants between age 6 and 9 months should receive complementary foods in addition to breast milk.

- The level of complementary feeding in Burkina Faso is not as high as in some other sub-Saharan countries. **Only 50 percent of infants age 6 to 9 months receive solid foods,** or a combination of solid foods and milk in addition to breast milk.

Figure 8
Infants Age 6 to 9 Months Receiving Solid Foods in Addition to Breast Milk in Burkina Faso Compared with Other Sub-Saharan Countries



Note: WHO recommends that by the age of 6 months all infants should receive solid foods and liquids in addition to breast milk.

Source: DHS Surveys 1994-1999

Figure 9: Stunting and Wasting among Children under 5 Years by Region, Burkina Faso

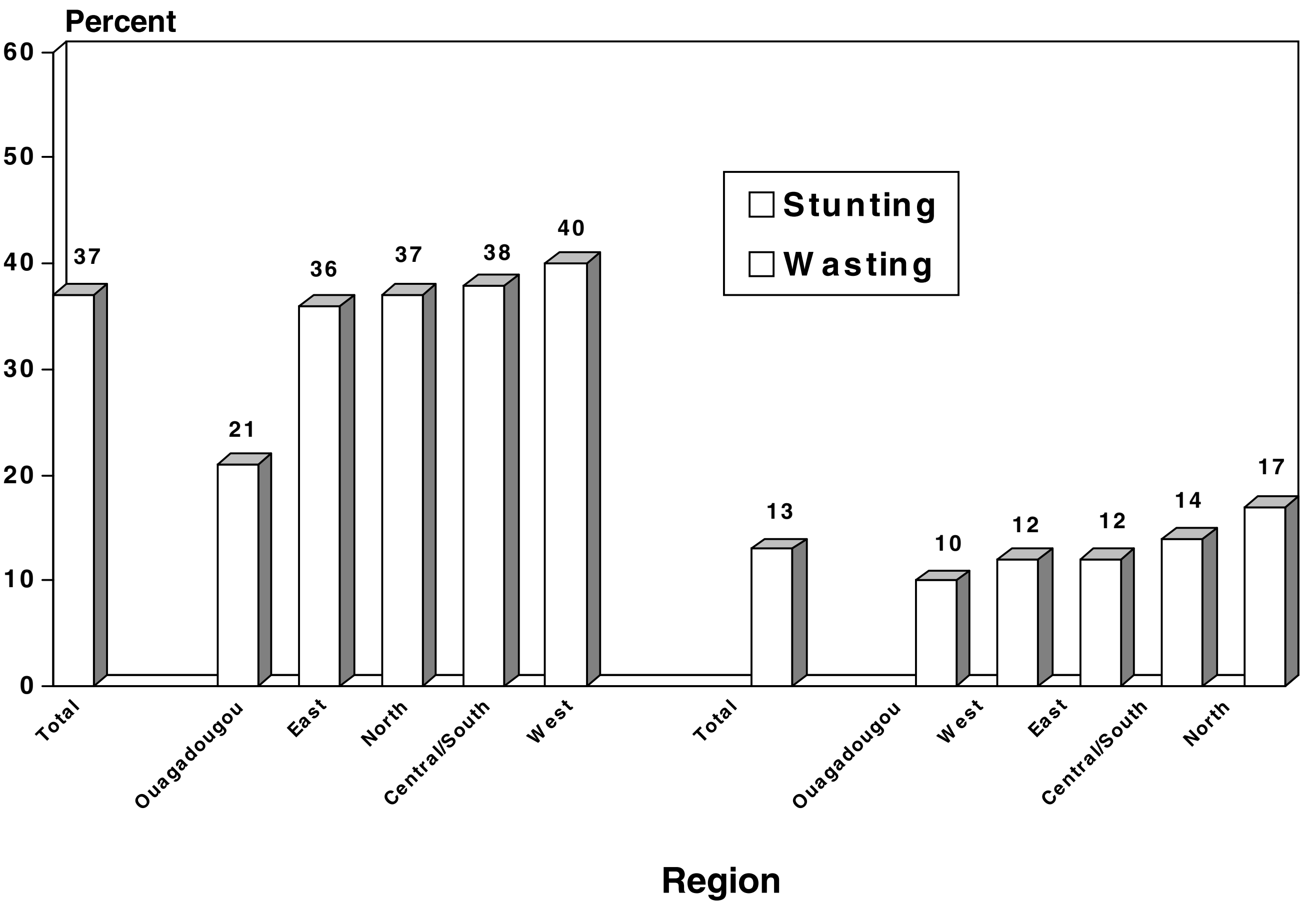
Wasting rates are generally lower than stunting rates in the five regions of Burkina Faso: Ouagadougou, East, North, Central/South, and West. Ouagadougou is both the capital city and a region.

In Burkina Faso:

- **Stunting ranges from 21 to 40 percent among children under 5 years.** The highest level of stunting was reported in the West Region where 40 percent of children under age five are stunted. The lowest level of stunting was reported in the urban area of Ouagadougou (21 percent).

- **Wasting levels range from 10 to 17 percent among children under 5 years**. The lowest level of wasting was found in Ouagadougou (10 percent), while the highest level was found in the North Region (17 percent).

Figure 9
Stunting and Wasting among Children under 5 Years by Region, Burkina Faso



Note: ***Stunting*** **reflects chronic malnutrition;**
wasting **reflects acute malnutrition.**

Source: BFDHS 1998-99

Figure 10: Stunting and Wasting among Children under 5 Years by Urban-Rural Residence, Burkina Faso

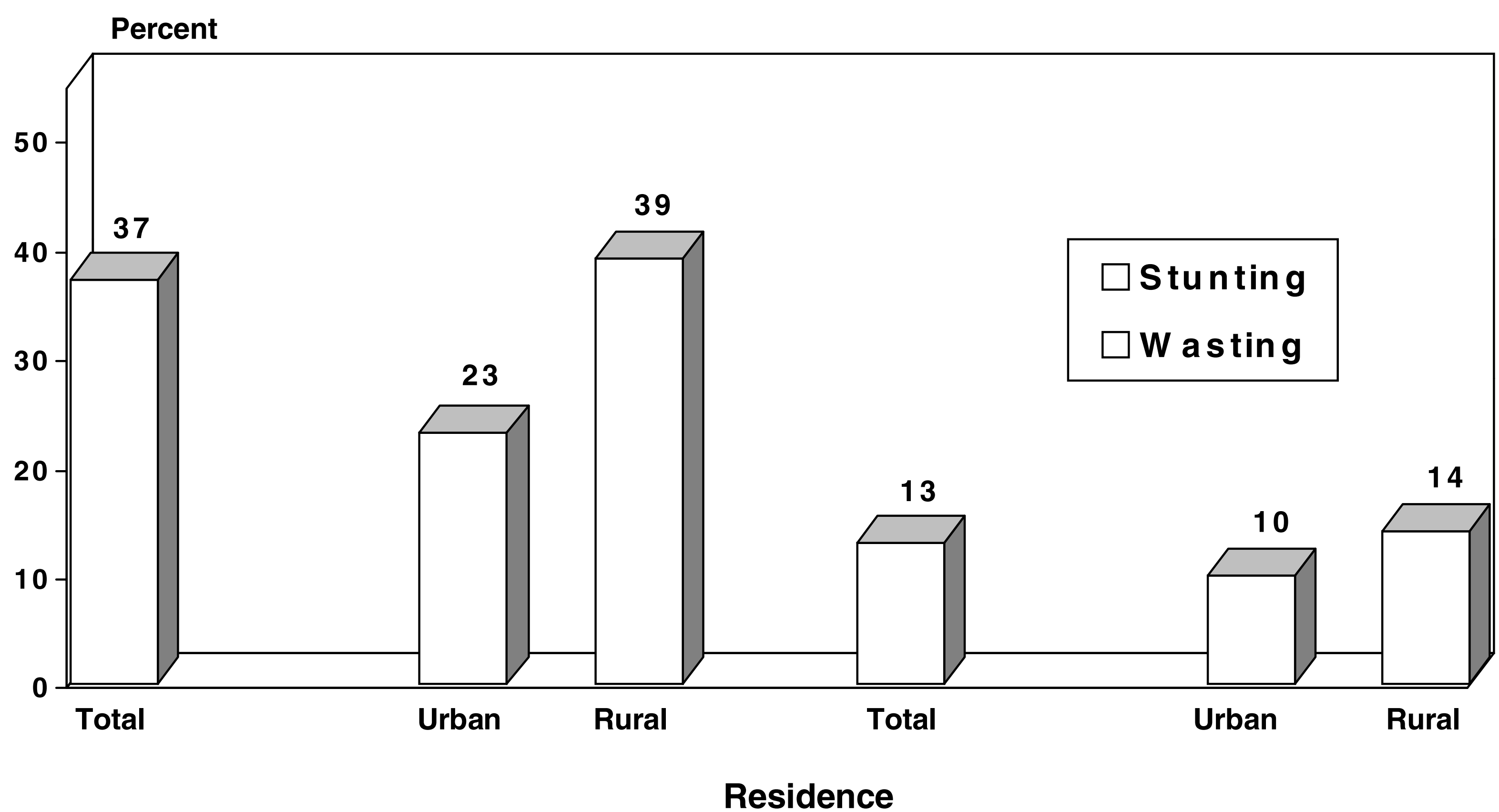
Health and socioeconomic conditions are often different in urban areas than in rural areas. Increased access to health care and better economic opportunities are some of the factors that lead to improved nutritional status among children in urban areas.

In Burkina Faso:

- **Stunting is highest in rural areas.** More than one-third (39 percent) of children in rural areas are stunted while less than one-fourth (23 percent) are stunted in urban areas.

- **Wasting is also highest in rural areas.** The level of wasting among children living in rural areas is 14 percent compared with about 10 percent among children in urban areas.

Figure 10
Stunting and Wasting among Children under 5 Years by Urban-Rural Residence, Burkina Faso



Note: ***Stunting*** **reflects chronic malnutrition;**
wasting **reflects acute malnutrition.**

Source: BFDHS 1998-99

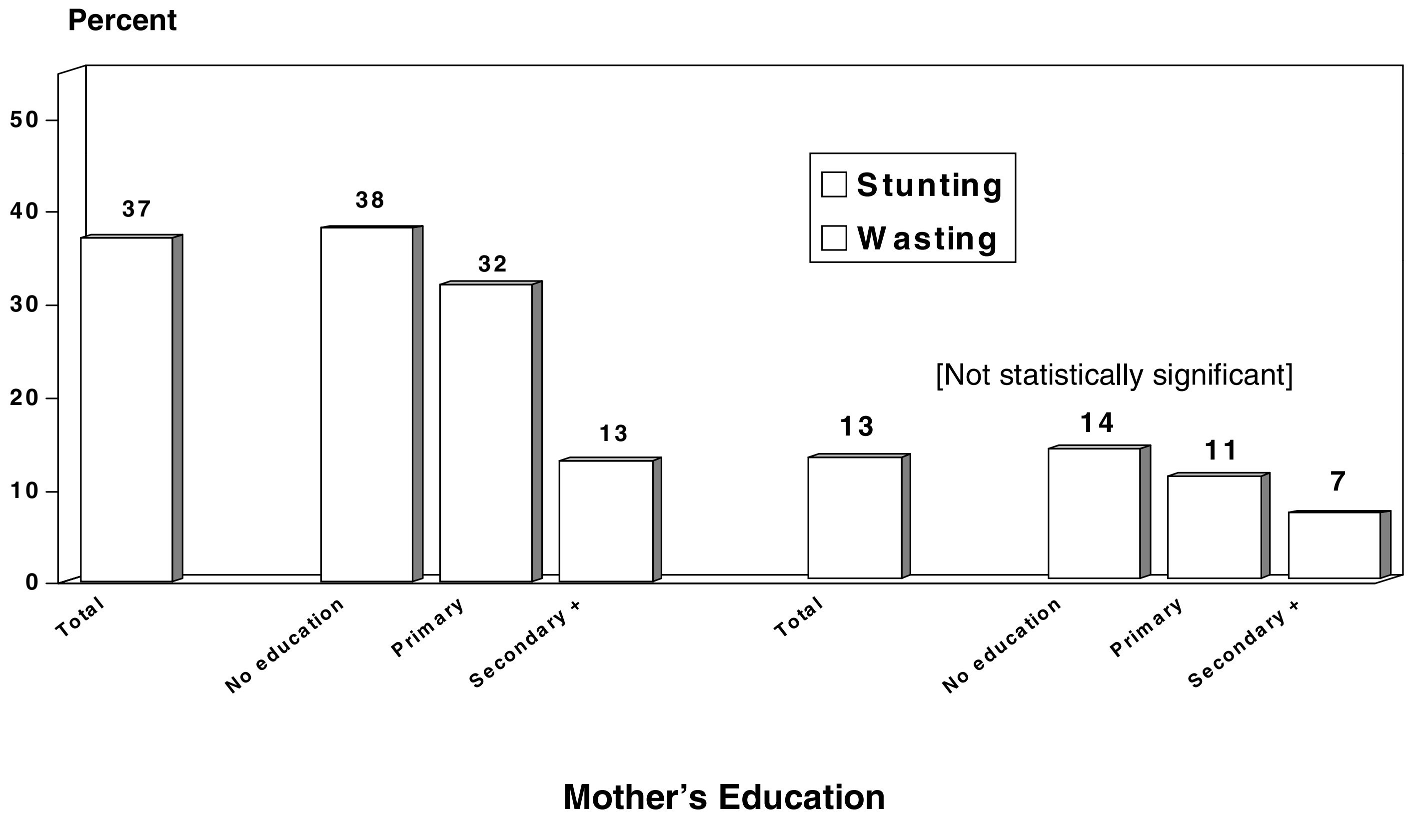
Figure 11: Stunting and Wasting among Children under 5 Years by Mother's Education, Burkina Faso

Maternal education is related to knowledge of good child-care practices and to household wealth. In Burkina Faso, 90 percent of mothers of children under five years of age have never attended school, while 7 percent have a primary education and 3 percent have a secondary or higher education. There are variations in school attendance especially between urban and rural areas. In rural areas, 95 percent of the mothers have never attended school and 5 percent have gone to primary school. In contrast, only 56 percent of mothers in urban areas have never attended school and 21 percent have a primary education. Maternal schooling levels are highest in the capital, Ouagadougou.

- **Children of mothers with a secondary education have less stunting.** Children under five whose mothers have secondary education have lower rates of stunting (13 percent) than those whose mothers have primary (32 percent) or no education (38 percent).

- **Children of mothers with a secondary education have less wasting**. Children whose mothers have primary or secondary education are less likely to be wasted (11 and 7 percent, respectively) than children of mothers who have no education (14 percent).

Figure 11
Stunting and Wasting among Children under 5 Years by Mother's Education, Burkina Faso



Note: ***Stunting*** **reflects chronic malnutrition;**
wasting **reflects acute malnutrition.**

Source: BFDHS 1998-99

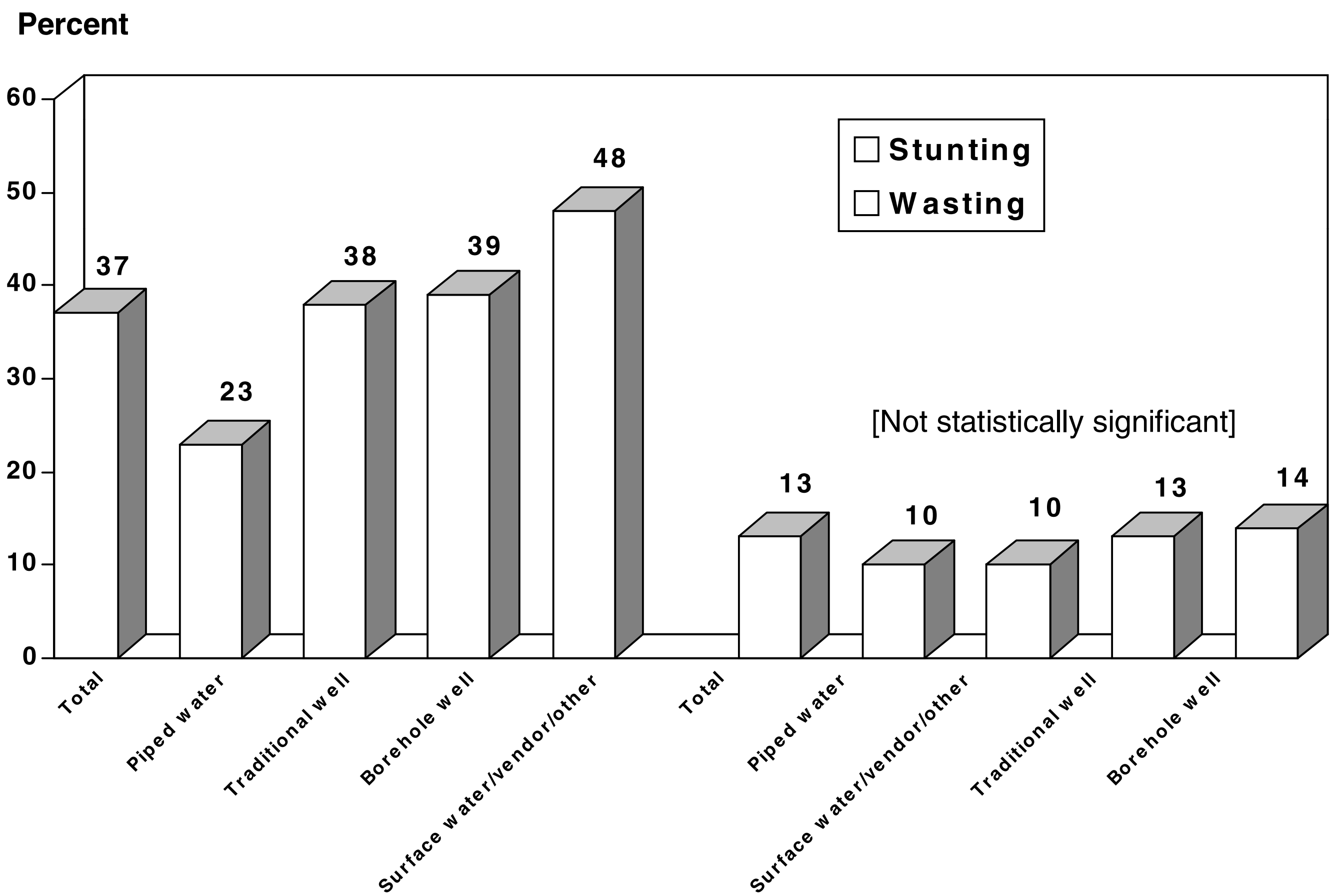
Figure 12: Stunting and Wasting among Children under 5 Years by Source of Drinking Water, Burkina Faso

A household's source of drinking water is linked with its socioeconomic status. Poor households are more likely to obtain drinking water from contaminated sources such as surface water or open wells than more affluent households. Without an adequate supply of quality water, the risks of food contamination, diarrheal disease, and malnutrition rise. Children from households that do not have water piped into the residence are at higher risk of being malnourished than those from households with this amenity. Among the households surveyed with children under five years, most use some sort of well. Forty-five percent use a traditional well as the household's main water source and 37 percent of households use a borehole well. Five percent use surface water. Only 11 percent have access to piped water.

- **The lowest rate of stunting among children under five years of age was found in households that use piped water (23 percent) as their source of drinking water.** The results show that all other types of water sources are more likely to be associated with higher rates of stunting in children.

- **There is no association between wasting in children and source of drinking water.** The proportion wasted children in households that rely on piped water (10 percent) was not statistically different from the proportion of wasted children in households that rely on surface water (10 percent) or wells (13 and 14 percent).

Figure 12
Stunting and Wasting among Children under 5 Years by Source of Drinking Water, Burkina Faso



Note: ***Stunting*** **reflects chronic malnutrition;**
wasting **reflects acute malnutrition.**

Source: BFDHS 1998-99

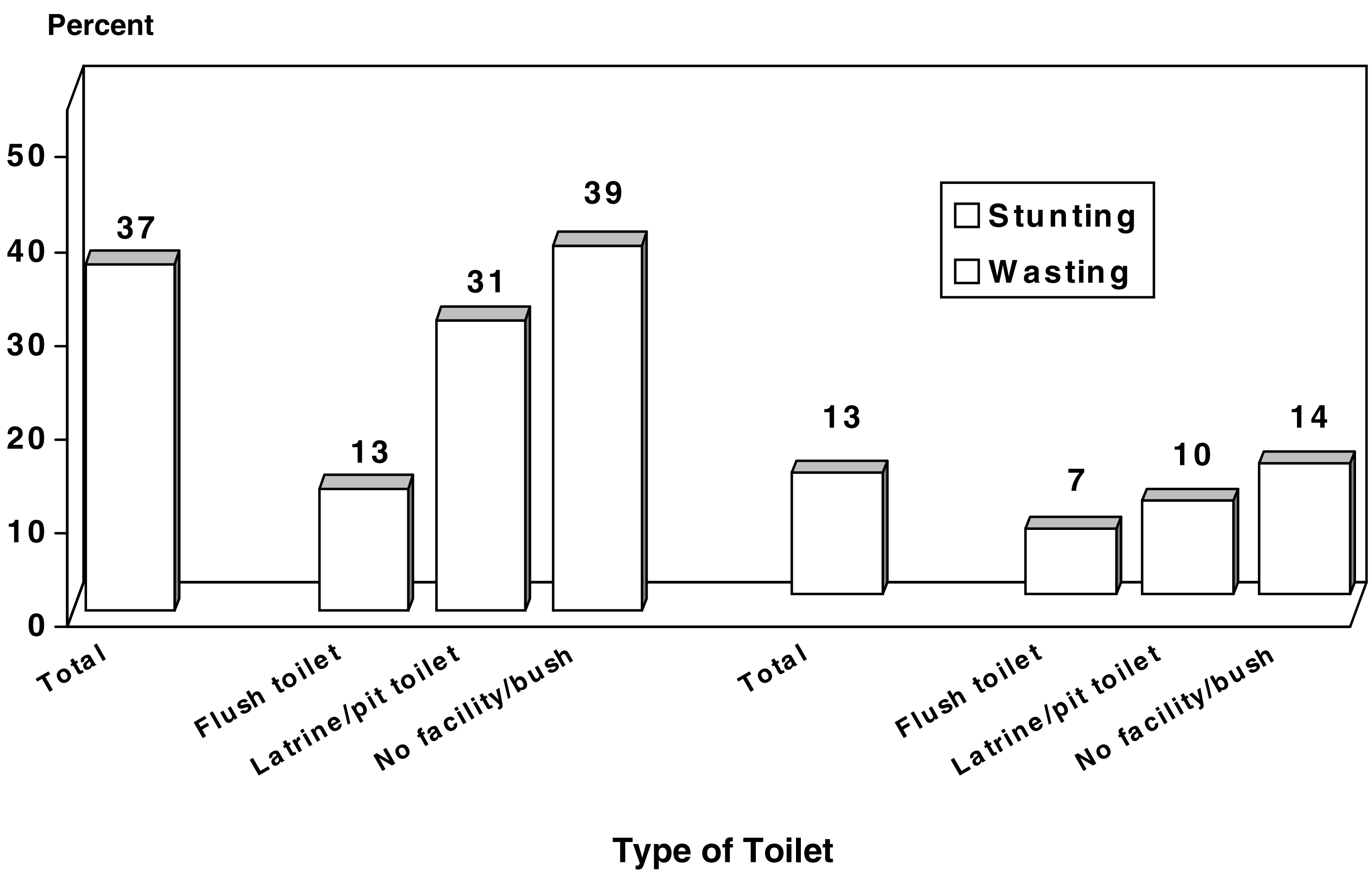
Figure 13: Stunting and Wasting among Children under 5 Years by Type of Toilet, Burkina Faso

The type of toilet used by a household reflects its wealth, and poor households are less likely to have adequate toilet facilities. Inadequate sanitation facilities result in an increased risk of diarrheal disease, which contributes to malnutrition. As with source of drinking water, easy access to a flush toilet may be associated with reduced risk of a child being malnourished but it does not ensure that a child will be well nourished. In Burkina Faso, most households do not have flush toilets. Eighty-one percent of households with children under five years have no facilities. Almost 18 percent have use of a latrine or pit toilet, whereas less than 1 percent (0.3) have access to a flush toilet.

- **Thirty-nine percent of children in households that do not have toilet facilities were stunted.**

- **Fourteen percent of children in households without toilet facilities were wasted.** Children in households with access to a flush toilet have the lowest rate of wasting (7 percent).

Figure 13
Stunting and Wasting among Children under 5 Years by Type of Toilet, Burkina Faso



Note: *Stunting* reflects chronic malnutrition; *wasting* reflects acute malnutrition.

Source: BFDHS 1998-99

Figure 14: Diarrhea and Cough with Rapid Breathing among Children under 5 Years, Burkina Faso

Acute respiratory infection (ARI) and dehydration due to diarrhea are major causes of morbidity and mortality in most sub-Saharan countries. In order to estimate the prevalence of ARI, mothers were asked if their children under five years had been ill with coughing accompanied by short rapid breathing in the past two weeks. For diarrhea, mothers were asked if their children under five years had symptoms of diarrhea in the past two weeks. Early diagnosis and treatment can reduce the rates of illness or death caused by these conditions.

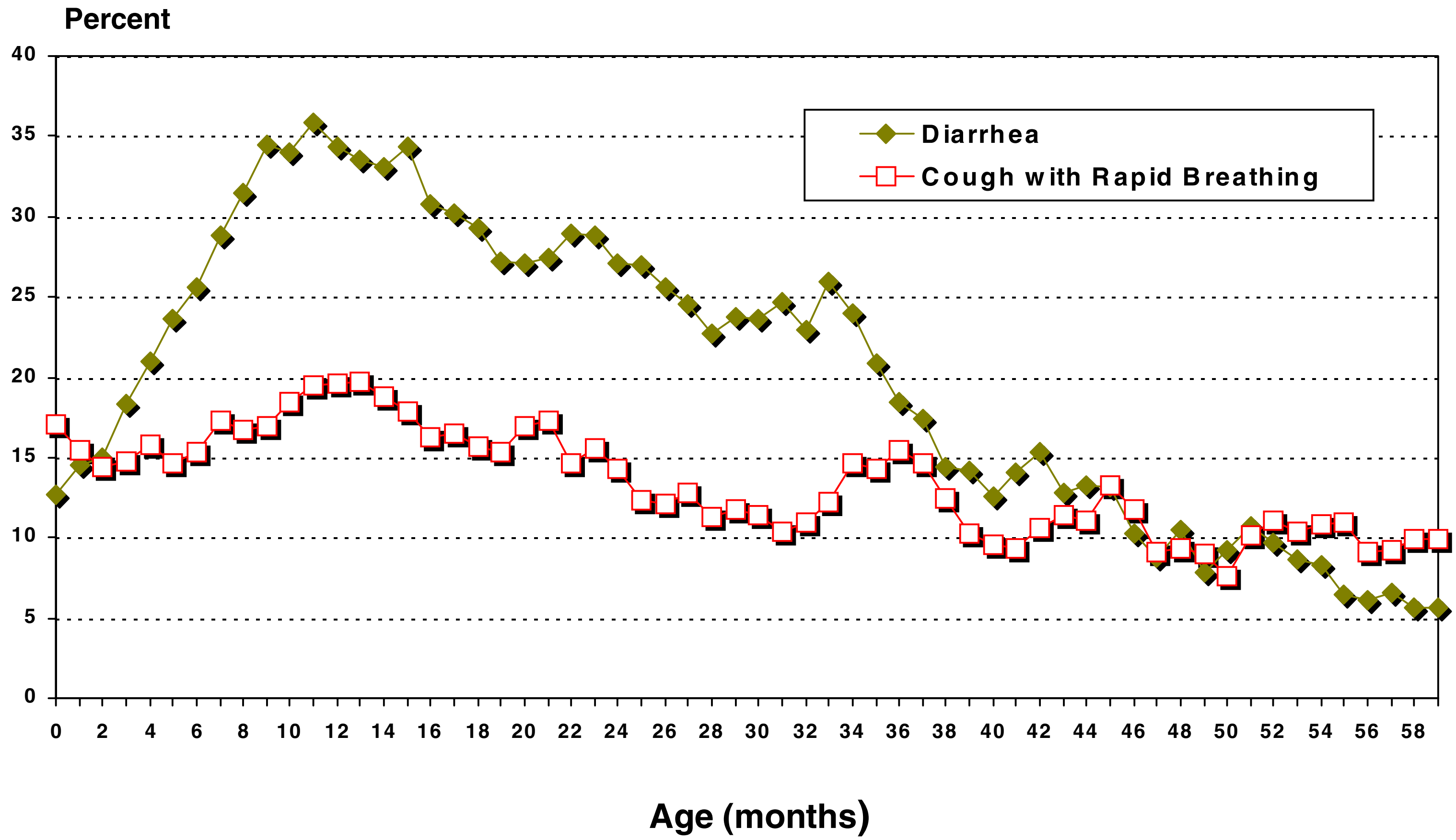
In Burkina Faso:

- **The prevalence of diarrhea increases steadily to 36 percent at 11 months of age.** By 29 months, diarrhea prevalence has fallen to 23 percent. This decline continues to the fifth year of life, when diarrhea prevalence is 6 percent.

- **The prevalence of cough with rapid breathing is 16 percent in the first month of life.** This increases to a peak of 20 percent by 13 months, and fluctuates between 15 and 20 percent during the first two years. From 23 months to the fifth year of life, the prevalence of cough with rapid breathing fluctuates between 10 and 15 percent. By the end of the fifth year, the proportion of children with cough and rapid breathing is only 10 percent.

The rapid rise in the prevalence of diarrhea during infancy reflects the increased risk of pathogen contamination associated with the early introduction of water, other liquids, and solid foods. In addition, once infants begin to crawl and move around they put objects in their mouth, also increasing the risk of pathogen contamination.

Figure 14
Diarrhea and Cough with Rapid Breathing among Children under 5 Years, Burkina Faso



Note: Rates have been smoothed using a five-month moving average.

Source: BFDHS 1998-99

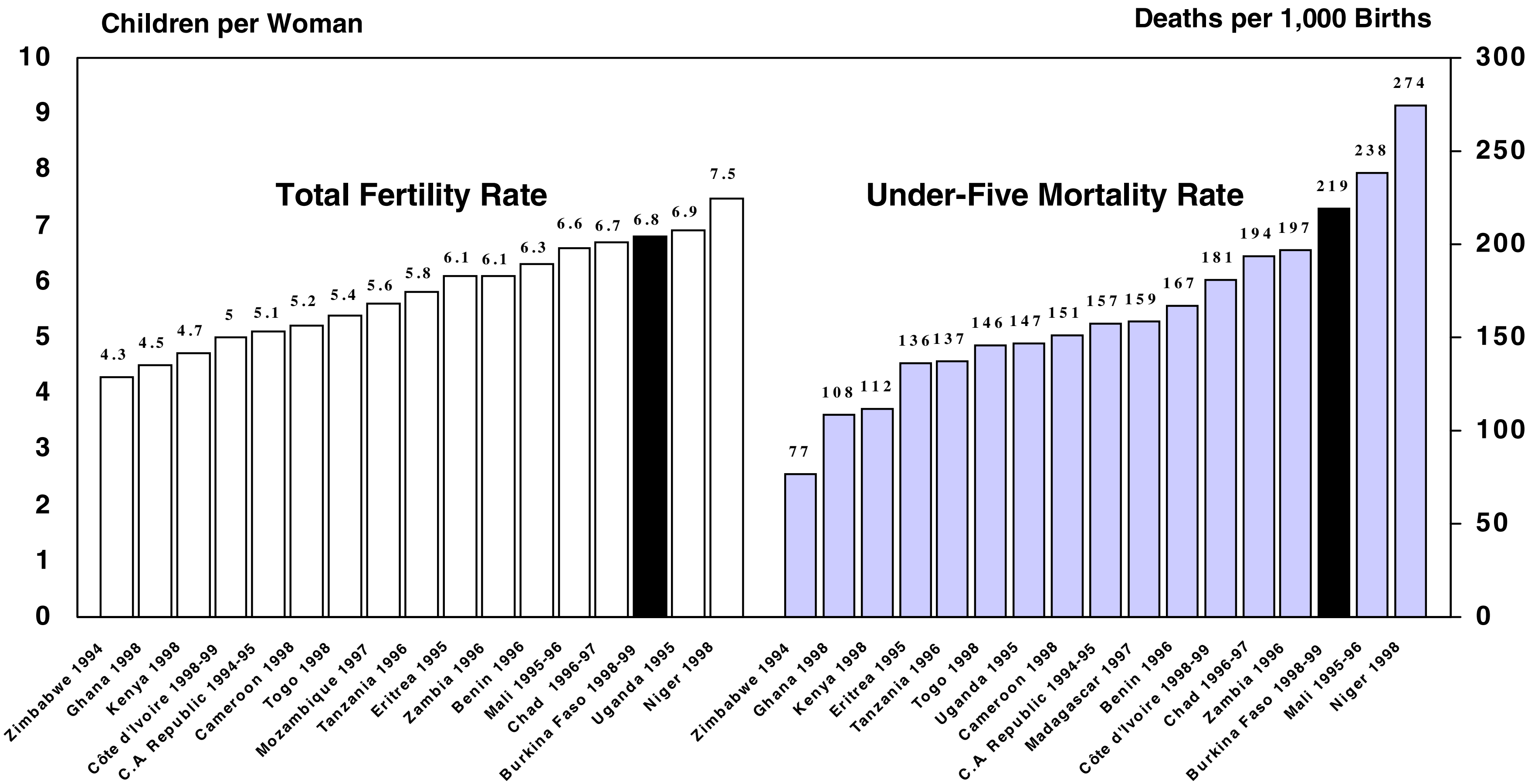
Figure 15: Fertility and Under-Five Mortality in Burkina Faso Compared with Other Sub-Saharan Countries

High fertility rates, especially when accompanied by short intervals between births, are detrimental to children's nutritional status. In most countries in sub-Saharan Africa, families have scarce resources to provide adequate nutrition and health care for their children. As the number of children per woman increases, fewer household resources are available for each child. High fertility also has a negative impact on women's health, thus increasing the chances that a mother may not be able to breastfeed or care for her children adequately. Young children, who are more vulnerable to malnutrition and disease, are more likely to die.

- **At current fertility levels, a woman in Burkina Faso will have an average of 6.8 children by the end of her childbearing years** (This is the total fertility rate for women age 15 to 49 years). The 1998-99 total fertility rate for Burkina Faso is among the highest of all the sub-Saharan countries surveyed.

- **The under-five mortality rate in Burkina Faso (219 deaths per 1,000 births) indicates that approximately 22 percent of children born in Burkina Faso will die before their fifth birthday.** This is also one of the highest rates among the countries surveyed.

Figure 15
Fertility and Under-Five Mortality in Burkina Faso Compared with Other Sub-Saharan Countries



Source: DHS Surveys 1994-1999

Figure 16: Survival and Nutritional Status of Children under 5 Years, Burkina Faso

Malnutrition and death take a tremendous toll on young children. This figure illustrates the proportion of children who are malnourished or have died at each month of age.

In Burkina Faso:

- **Between birth and 12 months of age, the percentage of children who are alive and not malnourished drops rapidly from 90 percent to approximately 38 percent.**

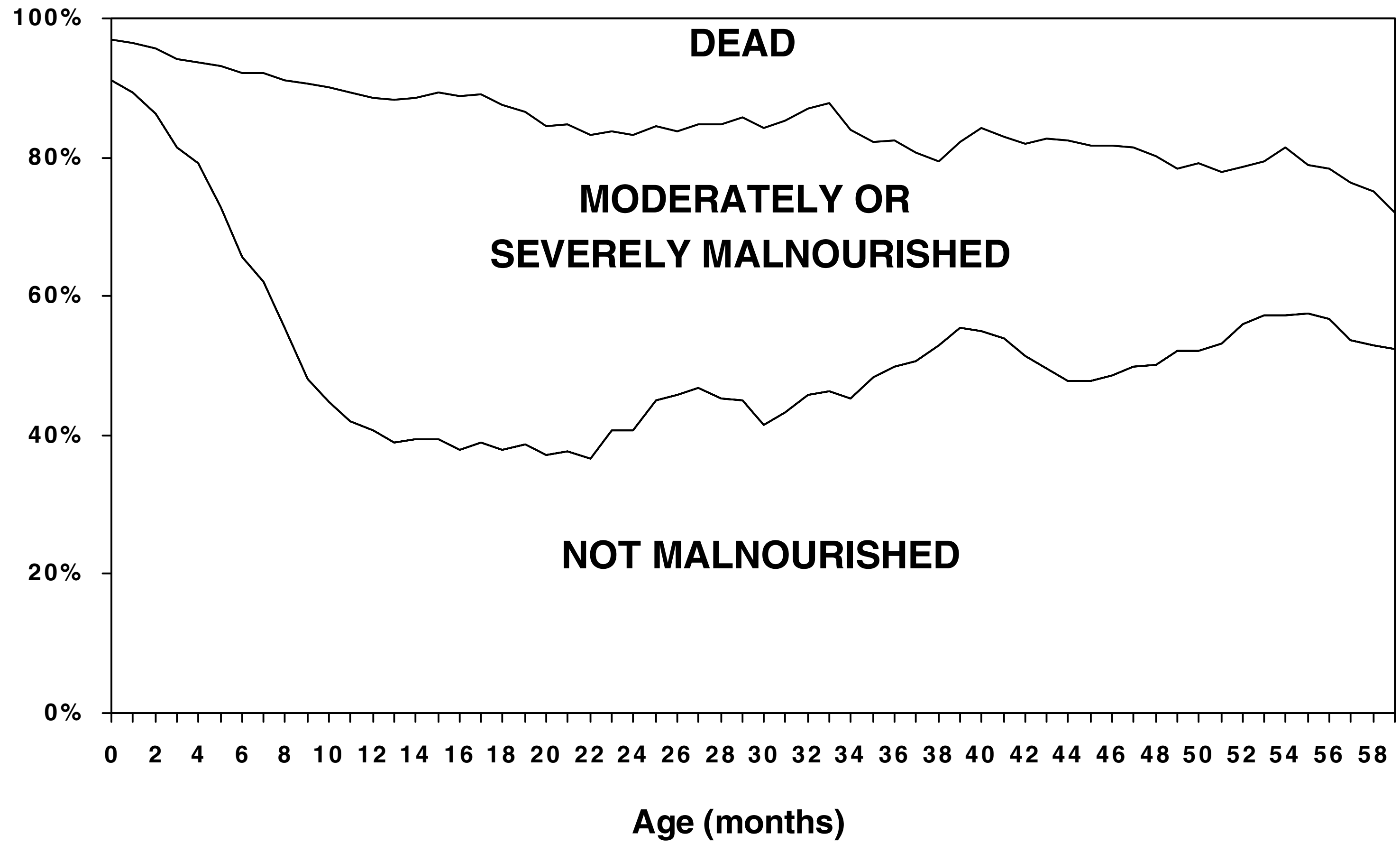
- **At age 21 months, 15 percent of children have died and 47 percent are severely or moderately malnourished.**[1]

- **By five years of age, about 26 percent of children under five have died.** Twenty percent are malnourished. Fifty-three percent are alive and not malnourished.

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[1]A child with a Z-score below -3 SD on the reference standards is considered severely malnourished while one with a Z-score between -3 and -2 SD is considered moderately malnourished.

Figure 16
Survival and Nutritional Status of Children under 5 Years, Burkina Faso



Note: A child with a Z-score below -3 SD on the reference standard is considered severely malnourished while one with a Z-score between -3 and -2 SD is considered moderately malnourished. Values have been smoothed using a five month rolling average.

Source: BFDHS 1998-99

Figure 17: Malnutrition and Under-five Mortality, Burkina Faso

Malnutrition is an important factor in the death of many young children in Burkina Faso. Formulas developed by Pelletier et al.[1] are used to quantify the contributions of mild, moderate, and severe malnutrition to under-five mortality.

In Burkina Faso:

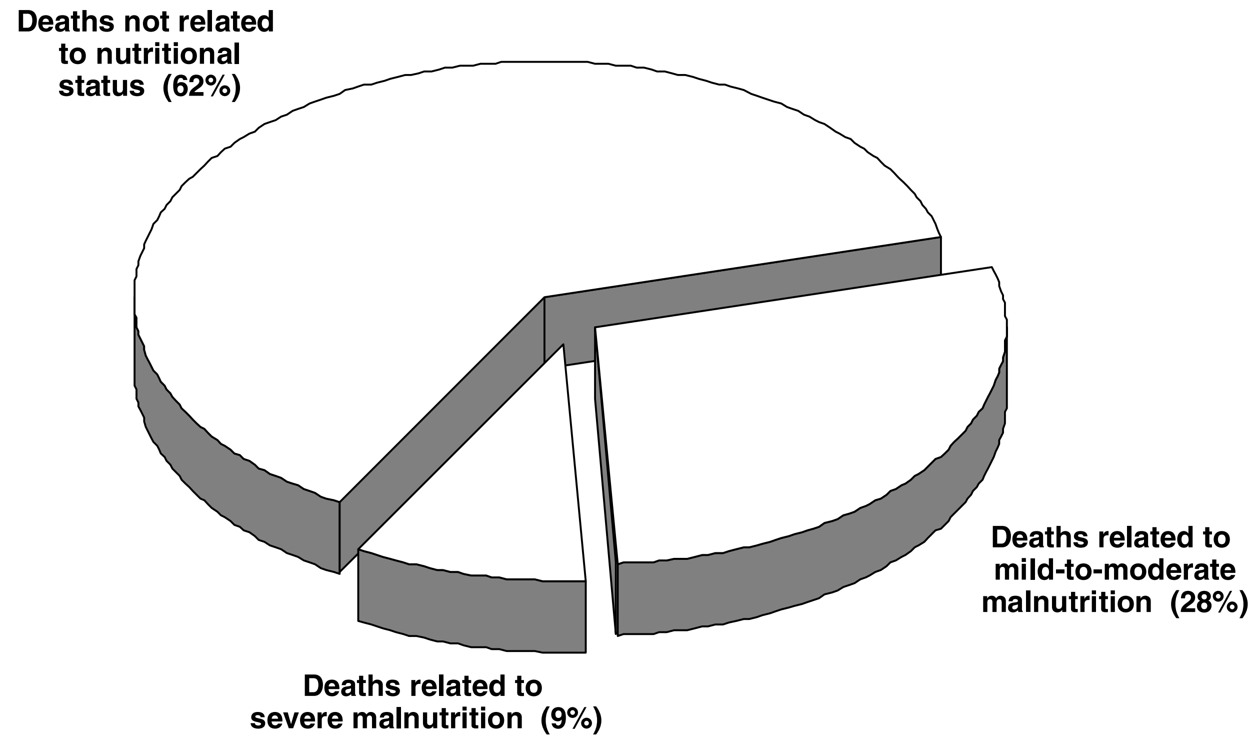
- **Thirty-seven percent of all deaths that occur before age five are related to malnutrition.**

- **Because of its prevalence, mild-to-moderate malnutrition (28 percent) contributes to more deaths than does severe malnutrition (9 percent).** Malnutrition contributes to child deaths by weakening the child's immune system.

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[1]Pelletier, D.L., E.A. Frongillo, Jr., D.G. Schroeder, and J.P. Habicht. 1994. A methodology for estimating the contribution of malnutrition to child mortality in developing countries. *Journal of Nutrition* 124 (10 Suppl.): 2106S-2122S.

Figure 17
Malnutrition and Under-five Mortality, Burkina Faso



Note: Calculation based on Pelletier et al., 1994.

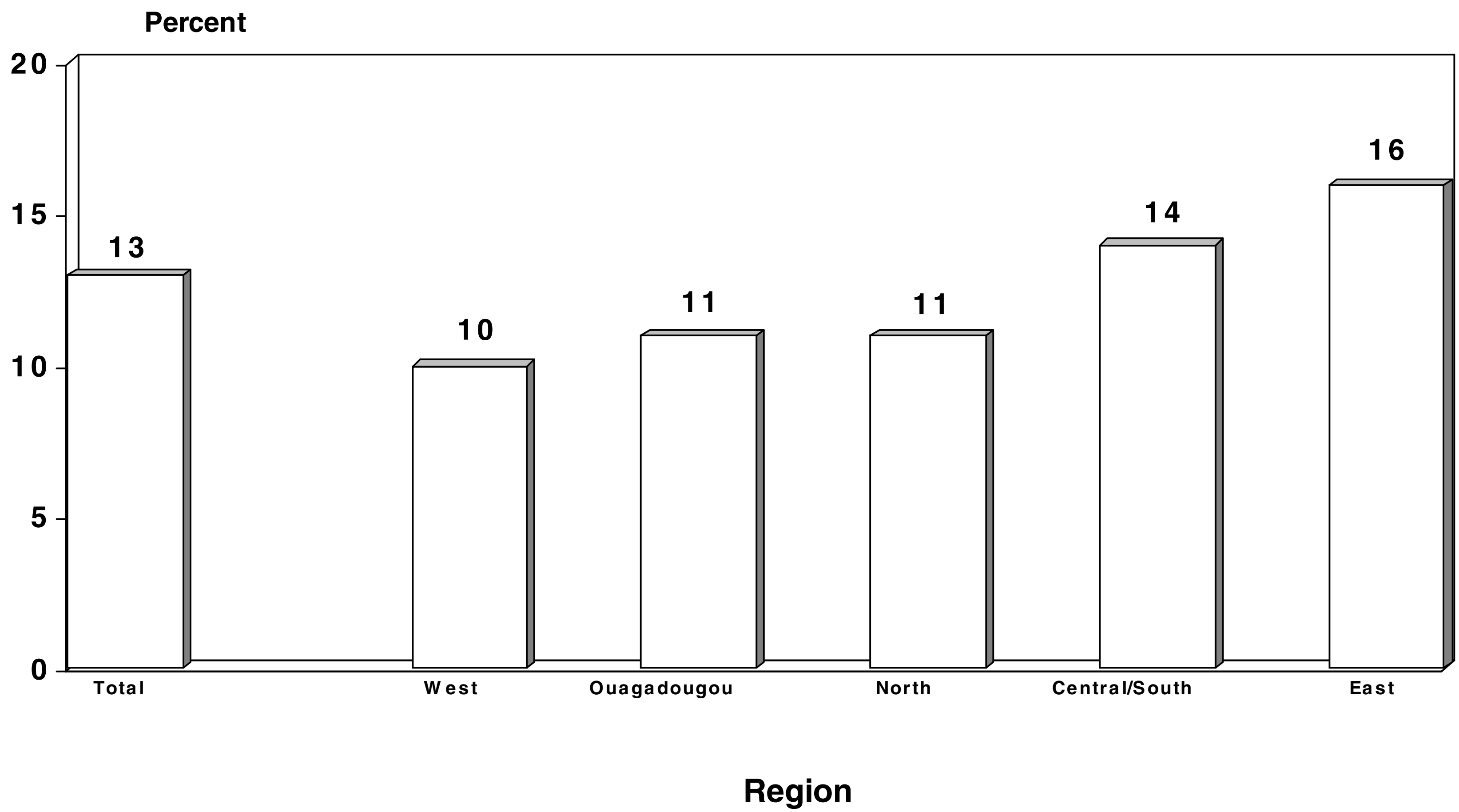
Source: BFDHS 1998-99

Figure 18: Malnutrition among Mothers of Children under 5 Years by Region, Burkina Faso

A mother's nutritional status affects her ability to successfully carry, deliver, and care for her children and is, therefore, of great concern in its own right. Malnutrition in women can be assessed using the Body Mass Index (BMI), which is defined as a woman's weight in kilograms divided by the square of her height in meters. Thus, BMI = kg/m^2. When the BMI falls below the suggested cut-off point of 18.5, this indicates chronic energy deficiency or malnutrition for nonpregnant women.

- **Thirteen percent of mothers of children under age five in Burkina Faso are malnourished.**
- **The highest rates of maternal malnutrition (16 percent) occur in the Eastern Region.** The lowest levels are found in the West Region (10 percent) and Ouagadougou (11 percent).

Figure 18
Malnutrition among Mothers of Children under 5 Years by Region, Burkina Faso



Note: Malnutrition levels are based on the percentage of mothers whose BMI is less than 18.5.

Source: BFDHS 1998-99

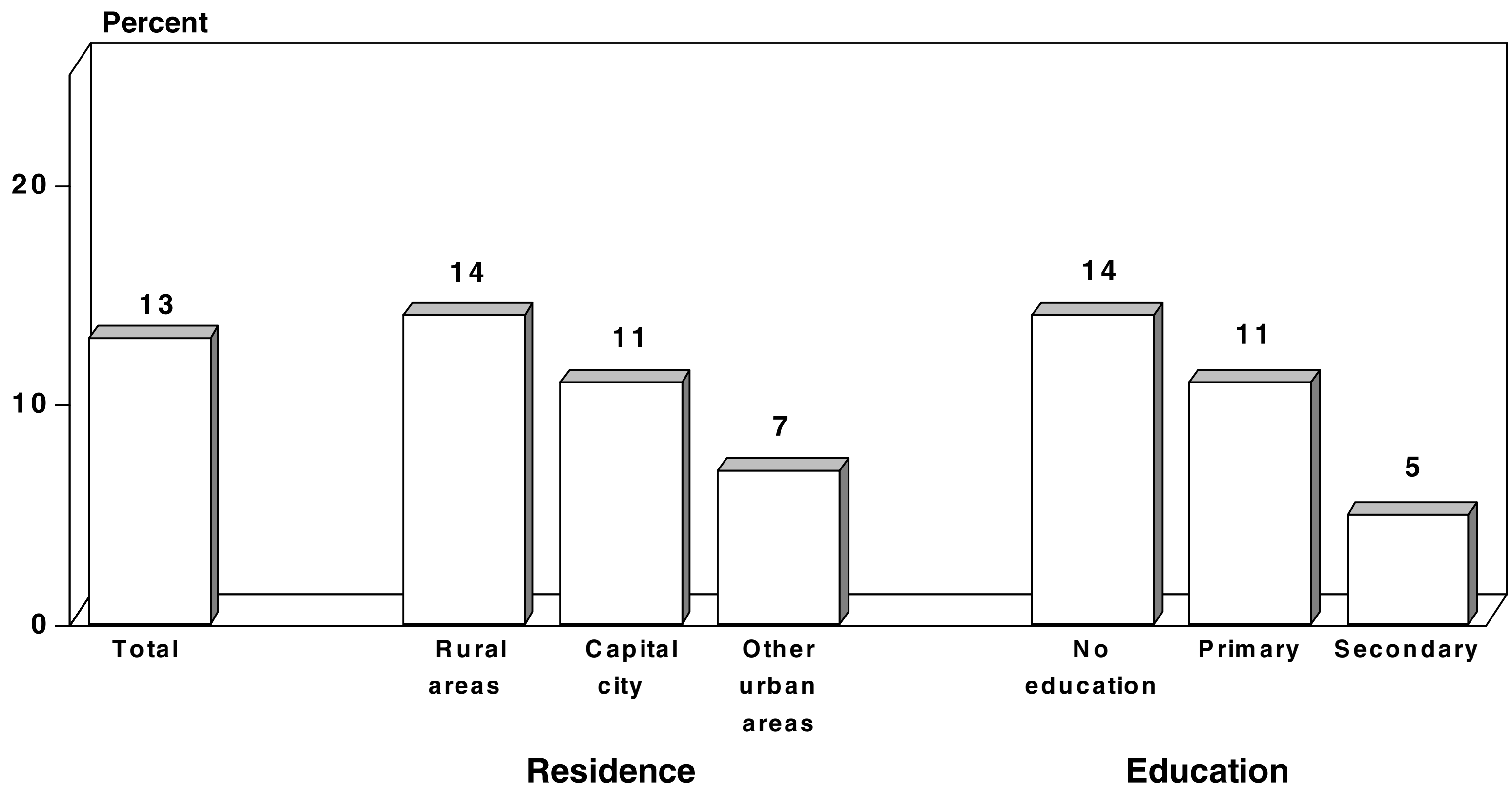
Figure 19: Malnutrition among Mothers of Children under 5 Years by Residence and Education, Burkina Faso

In Burkina Faso:

- **Mothers living in the capital city and other urban areas are less likely to be malnourished than those in rural areas.** Only 11 percent of mothers in the capital city and 7 percent in other urban areas are malnourished. Fourteen percent of mothers in rural areas are malnourished.

- **Mothers with no education are most likely to be malnourished.** Mother's with no education have higher rates of malnutrition (14 percent) than mothers with primary or secondary education (11 percent and 5 percent, respectively).

Figure 19
Malnutrition among Mothers of Children under 5 Years, by Residence and Education, Burkina Faso



Note: Malnutrition levels are based on the percentage of mothers whose BMI is less than 18.5.

Source: BFDHS 1998-99

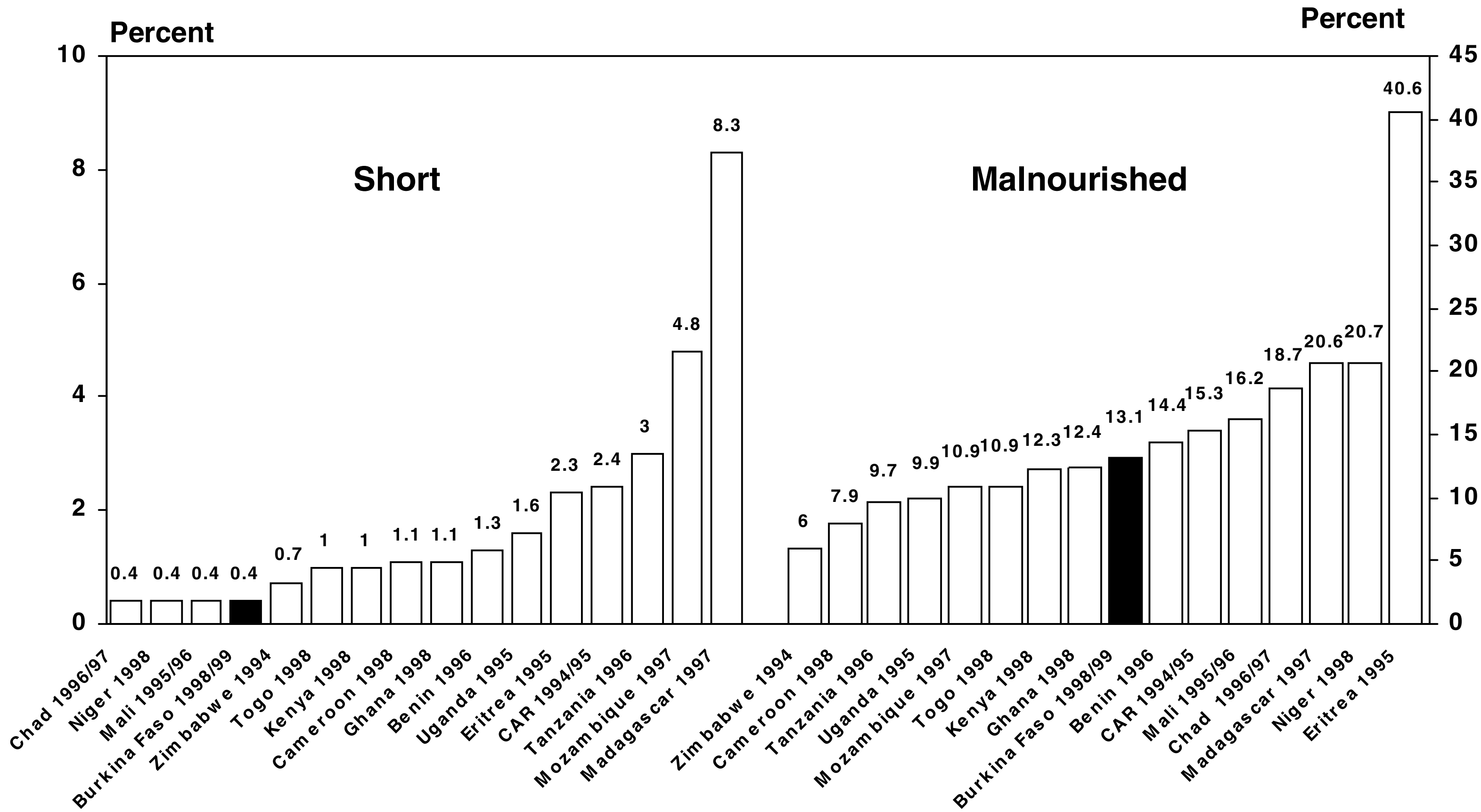
Figure 20: Malnutrition among Mothers of Children under 3 Years in Burkina Faso Compared with Other Sub-Saharan Countries

Malnutrition among mothers is likely to have a major impact on their ability to care for themselves and their children. Women less than 145 centimeters in height are considered too short. Mothers who are too short (a condition largely due to stunting during childhood and adolescence) may have difficulty during childbirth because of the small size of their pelvis. Evidence also suggests there is an association between maternal height and low birth weight. Underweight status in women is assessed using the Body Mass Index (BMI). Mothers whose BMI is less than 18.5 are considered malnourished.

- **Less than 1 percent (0.4) of mothers of children under three years of age are too short (<145 cm).** This rate is in the lower range among the sub-Saharan countries surveyed.

- **Approximately 13 percent (13.1) of mothers with children under three years of age are malnourished.** This is in the middle of the sub-Saharan countries surveyed.

Figure 20
Malnutrition among Mothers of Children under 3 Years in Burkina Faso Compared with Other Sub-Saharan Countries



Note: ***Short*** **is the percentage of mothers under 145 cm;** ***malnourished*** **is the percentage of mothers whose BMI is less than 18.5.**

Source: DHS Surveys 1994-1999

Appendix 1
Malnutrition Rates for Children under 5 Years by Background Characteristics
Burkina Faso

Background Characteristic	Stunted	Wasted	Under-weight	Background Characteristic	Stunted	Wasted	Under-weight
Child's Age in Months				**Region**			
0-5	5.0	7.0	4.0	Ouagadougou	20.7	10.2	20.7
6-11	14.7	24.5	34.5	North	36.7	16.6	36.8
12-17	37.1	30.2	55.0	East	35.5	12.4	32.9
18-23	56.9	18.2	47.1	West	40.0	11.7	36.2
24-29	42.2	13.8	43.2	Center/South	38.4	14.3	35.7
30-35	51.4	10.9	46.7				
36-47	50.8	5.0	33.5				
48-59	46.0	2.8	26.7				
n=3,791	p<0.000	p<0.000	p<0.000	n=3,791	p<0.000	p<0.05	p<0.01
Child's Sex				**Urban-Rural Residence**			
Female	34.9	12.1	35.1	Rural	38.8	13.7	36.0
Male	38.6	14.2	33.6	Capital city	20.7	10.2	20.7
				Other urban areas	24.7	8.5	23.8
n=3,791	p<0.05	NS	NS	n=3,791	p<0.000	p<.05	p<0.000
Overall	36.8	13.2	34.3		36.8	13.2	34.3

Note: Level of significance is determined using the chi-square test.
NS = Not significant

Appendix 2
WHO/CDC/NCHS International Reference Population

The assessment of nutritional status is based on the concept that in a well-nourished population the distributions of children's height and weight, at a given age, will approximate a normal distribution. This means that about 68 percent of children will have a weight within 1 standard deviation of the mean for children of that age or height, and a height within 1 standard deviation of the mean for children of that age. About 14 percent of children will be between 1 and 2 standard deviations above the mean; these children are considered relatively tall or overweight for their age or relatively fat for their height. Another 14 percent will be between 1 and 2 standard deviations below the mean; these children are considered relatively short or underweight for their age or relatively thin for their height. Of the remainder, 2 percent will be very tall or very overweight for their age or very overweight for their height, that is, they are more than 2 standard deviations above the mean. Another 2 percent will fall more than 2 standard deviations below the mean and be considered malnourished. These children are very short (stunted) or very underweight for their age or very thin (wasted) for their height.

For comparative purposes nutritional status has been determined using the International Reference Population defined by the United States National Center for Health Statistics (NCHS standard) as recommended by the World Health Organization and the Centers for Disease Control.

Appendix 2
WHO/CDC/NCHS International Reference Population, Normal Distribution

